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(54) **PULVERISATEUR D'HYDROCORTISONE POUR
ADMINISTRATION TOPIQUE**

(54) **CORTISONE SPRAY FOR TOPICAL ADMINISTRATION**

(57) L'invention concerne une préparation pharmaceutique d'application dermique d'hydrocortisone. Ce principe actif est dispersé par adjonction d'un ester d'acide gras partiel de sorbitane de polyéthylène et d'autres auxiliaires tels que la lécithine et l'huile neutre. Ce système permet d'obtenir une suspension de particules de l'ordre du nanomètre du principe actif hydrocortisone lipophile.

(57) The present invention relates to a pharmaceutical mixture for the dermal application of hydrocortisone. The active agent is dispersed with the addition of a partial fatty acid ester of polyoxyethylene sorbitan and other auxiliaries like lecithin and neutral oil. This provides a suspension of nanoparticles of the lipophilic agent hydrocortisone.



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Cortisol Spray

15 The present invention relates to a pharmaceutical composition for the dermal application of hydrocortisone or a derivative thereof, a method for manufacture of this pharmaceutical composition as well as its application in therapy.

10 The body specific glucocorticoid hormone (cortisol), *Merck Index Eleventh Edition (1989)* No. 4710, page 4711, chemical description: 11, 17, 21-trihydroxy-pregn-4-en-3,20-dion, is dermally administered as an anti-inflammatory agent for treating inflammatory diseases, e.g. eczemas, psoriasis, dermatitis, contact allergies etc. The *Index Nominum 1992/93, Swiss Pharmaceutical Society, Medpharm, Scientific Publ. D-Stuttgart* lists for the active ingredient hydrocortisone 81 dermal preparations with registered trademarks. Of the derivatives, in particular the 21-acetate there are likewise known numerous preparations.

25 Since the mentioned inflammatory skin diseases can be resistant and protracted, a dermal preparation should be suitable for administering over a longer period of time. With the prolonged application of glucocorticoids on the skin in spite of a good effectiveness and provable healing successes, systemic effects and side effects are

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problematic, for this see section G10 in Rote Liste 1994,
Arzneimittelverzeichnis des BPI (Bundesverband der Pharma-
zeutischen Industrie), ECV Editio Cantor, D-88322 Aulen-
dorf, No. 64009. Numerous dermal preparations therefore,
5 instead of one of the highly effective new active ingredients
of the glucocorticoid type described numerously in
the literature, contain only the more weakly effective
hydrocortisone which has been known for a long time and
this even further in an extremely small dosage, e.g. most-
10 ly 1 mg per gram of formulation. One has therefore
attempted to improve the lower effectiveness of such prep-
arations by increasing the dosage. Preparations with a
higher dosage even of hydrocortisone must however due to
the known side effects and the numerous counter indi-
15 cations be subjected to medical control and mandatory pre-
scription.

It is therefore the object of the invention to
manufacture for the well-tried active ingredient
20 hydrocortisone a dermal preparation with an improved
effectiveness with a smaller dosage.
In the narrower sense, it is the object of the present
invention to manufacture for the active ingredient
hydrocortisone an improved dermal preparation which is
25 suitable for releasing without prescription as a so-called
OTC preparation (Over-the Counter preparation) within the
framework of the so-called self-medication.

The achievement of the object is based on the consideration that by increasing the solubility of the active ingredient hydrocortisone in the formulation base, an improvement in effectiveness with an unchanged low concentration is to be achieved. Hydrocortisone itself is weakly soluble in water which in dermal formulations is a considerable constituent. The *Merck Index, loc, cit.*, indicates a water solubility of 0.28 mg/ml (25°C). In ethanol the active ingredient is more soluble: 15 mg/ml (25°C).

10 The addition of large quantities of ethanol for improving the solubility of the active ingredient is not suitable for dermal preparation, since ethanol for other constituents of the formulation likewise acts as a solvent and encourages the drying of the skin. Alternatively to the

15 application of an unsuitable solvent numerous publications suggest aqueous finely dispersed systems with dissolving properties based on lipid mixtures. Herein the insoluble active ingredient is enclosed in lipid particles with a particle size of less than 1 µm, which with the aqueous

20 carrier fluid form a colloid-dispersed or finely dispersed system, which although does not represent an true molecular dispersed solution, is however sufficiently homogeneous for a dermal formulation. In the literature on the subject there is mentioned the encapsulation of lipophils

25 and/or weakly soluble active ingredients in micelles, mixed micelles, reverse micelles, unilamellar or multi-lamellar liposomes, nanocapsules, nanoparticles etc.

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The document DE-A-4018995 describes the incorporation of
5 corticosteroids into an amphiphilic, non-ionic lipid
phase, which in an aqueous phase forms vesicles with a
size of 10 to 5000 nm. The document WO-A-93/18752
describes compositions for the dermal application of phar-
maceutical products with particles from an oily fluid,
10 from an emulsifying agent, e.g. a phospholipid, and from a
non-ionic tenside. The particles have a size of 50 to 500
nm which in the examples in the document are achieved by
treatment in a homogeniser. For the oily fluid as well as
for the emulsifying agent and the tenside in each case
15 there are mentioned numerous possible substances in the
document.

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It has been surprisingly found out that a lipophile formulation base consisting of partial fatty acid ester of polyoxyethylene sorbitan, of a phospholipid and of a neutral oil is suitable for manufacturing a particularly homogeneous finely dispersed nanodispersion of the active ingredient hydrocortisone. The present invention has as the subject-matter a pharmaceutical composition for the dermal application of a corticoid, which has the following constituents:

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a) the active ingredient 11, 17, 21 -trihydroxypregn-4-en-3,20-dion (hydrocortisone) or a derivative thereof, where appropriate in combination with a wound healing agent;

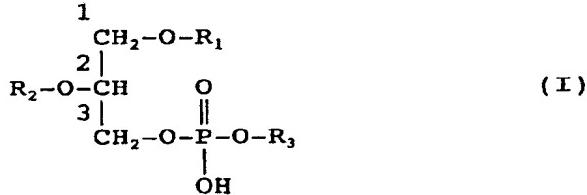
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b) at least one partial fatty acid ester of polyoxyethylene sorbitan or a combination thereof;

20

c) at least one essentially pure phospholipid of the formula:

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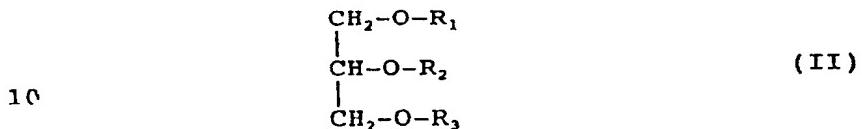
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where R_1 indicates C_{10-20} -acyl, R_2 hydrogen or C_{10-20} -acyl, R_3 hydrogen, 2-trimethylamino-1-ethyl, 2-amino-1-ethyl, C_{1-4} -alkyl, C_{1-5} -alkyl substituted by carboxy, C_{2-5} -alkyl substi-

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tuted by hydroxy, C₂₋₅-alkyl substituted by carboxy and hydroxy or C₂₋₅-alkyl substituted by carboxy and amino, the inositol or glyceryl group, or salts of these compounds;

5 d) a triglyceride of the formula:



where R₁, R₂ and R₃ indicates C₈₋₂₄-acyl;

- 15 e) water as a carrier fluid in the purity required for the transdermal application; and where appropriate
f) aiding agents suitable for dermal forms of administration.

20 This pharmaceutical composition is distinguished by favourable phase properties of the solubilised active ingredient. Thus with a present opalescence and transparency in counter light it is only to be recognised by an extremely slight milky murkiness that the suspension still has physical differences with respect to the ideal condition of a pure molecular solution. Electron microscope imaging shows that a population of more than 98% of the active ingredient is present in a Gaussian distribution as a dispersion of particles (nanoparticles) with a particle size of less than approx. 50 nm (nanodispersion).

These differences with respect to a pure solution are however acceptable on account of the particularly good homogeneity properties of the dispersion, which for example can be detected by a surprisingly high storage stability, e.g. no segregation after a storage lasting several months at temperatures of up to room temperature (the stability to be expected by extrapolation is longer than two years). All these properties may be achieved without the additional application of a homogeniser by way of a simple mixing of the constituents.

A preferred embodiment form concerns a pharmaceutical composition containing:

- 15 a) the active ingredient hydrocortisone or the 21-acetate, where appropriate in combination with dexpanthenol;
- b) the composition consisting of polysorbate 20, 80 and 60;
- c) purified lecithin from soya beans;
- 20 d) a triglyceride from the group of neutral oils; and
- e) water as a carrier fluid in the purity required for the dermal application; and where appropriate
- f) aiding agents suitable for dermal forms of administration.

25

The active ingredient hydrocortisone - component a) - in the pharmaceutical composition described nearer the beginning is contained in the dosage allowable

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for the dermal application. In the commercial formulation
5 according to the *Rote Liste* or *Arzneimittelkompendium der Schweiz, Documed Basel, Schweiz*, in prescription-free pre-

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parations there is contained a dose of approx. 0.1 to 0.5% (calculated with respect to free hydrocortisone).

A derivative of hydrocortisone is in particular
5 the 21-acetate, 21-acetate-17-propionate (aceponate), 21-
bendazac, 17 α -butyrate, 17 α -butyrate-21-propionate, 21-
cipionate (cyclopentane propionate), 21-disodium phos-
phate, 21-hydrogen succinate, 21-sodium succinate, 21-
tebutate (tert. butyl acetate), 17-valerate or xanthogen-
10 ate.

The active ingredient hydrocortisone or one of
the mentioned derivatives may in the pharmaceutical compo-
sition be contained in combination with a known wound
15 treating agent or epithilisation agent, e.g. dexpanthenol.

The component b) - partial fatty acid ester of
polyoxyethylene sorbitan - consists preferably of an
essentially pure or mixture of various esters of sorbitan,
20 wherein the structure of the fatty acid groups and the
length of the polyoxyethylene chains vary. The sorbitan is
preferably ethered by three hydrophilic polyoxyethylene
chains and estered by a hydrophobic fatty acid group. The
sorbitan may however also be ethered only by one or two
25 hydrophilic polyoxyethylene chains and accordingly est-
ered by three or two hydrophobic fatty acid groups. In
total the sorbitan base body is substituted by at least
one to at most three hydrophilic polyoxyethylene groups

and accordingly by at most three and at least one hydrophobic fatty acid group.

The polyoxyethylene chain is straight-chained
5 and comprises preferably 4-10, in particular 4-8, ethylene oxide units. The ester groups on the sorbitan base body are derived from a saturated or unsaturated, straight-chained carbon acid and an even number of 8-10 C-atoms. The ester group derived from this carbon acid is preferably straight chained with 12, 14, 16 and 18 C-atoms, e.g. n-dodecanoyl, n-tetradecanoyl, n-hexadecanoyl or n-octadecanoyl. The ester group derived from an unsaturated carbon acid with an even number of 8-20 C-atoms is preferably straight-chained with 12, 14, 16 and 18 C-atoms, e.g. 10 oleoyl. The mentioned esters of sorbitan, fulfil the details mentioned in the British Pharmacy list (special monograph) or Ph. Helv. VII. There applies in particular the product descriptions published by the mentioned manufacturers with the details of data sheets for the product concerned, in particular specifications such as form, colour, HLB-value, viscosity, rising melting point and solubility.
15
20

Suitable partial fatty acid esters of polyoxyethylene sorbitan are commercially obtainable under the name Tween® of the company ICI and known under the chemical description polyoxyethylene (20 or 4)-sorbitan monolaurate (TWEEN 20 and 21), polyoxyethylene-(20)-sorbitan
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monopalmitate or monostearate (TWEEN 40 and 60), polyoxyethylene-(4 or 20)-sorbitan-monostearate or tristearate (TWEEN 61 and 65), polyoxyethylene- (20 or 5)-sorbitan monooleate (TWEEN 80 or 81) or polyoxyethylene-(20)-sorbitan trioleate (TWEEN 85).

In a particularly preferred embodiment form of the invention one uses as component b) a combination consisting of TWEEN 20, TWEEN 80 and TWEEN 60, or polysorbate 10 20, 80 and 60.

The component b) is contained in the pharmaceutical composition in a quantity part of approx. 1.0% to 5.0%, preferably 1.0% to 3.0% (with respect to the total 15 weight of the formulation).

Component c) phospholipid of the formula I. The nomenclature of the phospholipid (I) and the numbering of 20 the C-atoms is effected by way of the recommendations (sn-nomenclature, stereospecific numbering) cited in the Eur. J. of Biochem. 79, 11-21 (1977) of the IUPAC-IUB Commission on Biochemical Nomenclature (CBN).

R₁ and R₂ with the meanings C₁₀₋₂₀-acyl are preferably straight chained C₁₀₋₂₀-alkanoyl with an even number of C-atoms and straight-chained C₁₀₋₂₀ alkenoyl with a double bonding and an even number of C-atoms.

- 10 -

Straight chained C₁₀₋₂₀ alkanoyl R₁ and R₂ with an even number of C-atoms are for example n-dodecanoyl, n-tetradecanoyl, n-hexadecanoyl or n-octadecanoyl.

5 Straight chained C₁₀₋₂₀ alkanoyl R₁ and R₂ with a double bonding and an even number of C-atoms are for example 6-cis- or 6-trans-, 9-cis- or 9-trans-dodecenoyl, -tetradecenoyl, -hexadecenoyl, -octadecenoyl or -icosenoyl, in particular 9-cis-octadecenoyl (oleoyl),
10 further 9,12-cis-octadecadienoyl or 9, 12, 15-cis-octa-decatrienoyl.

A phospholipid (I), wherein R₃ indicates 2-tri-methylamino-1-ethyl is described with the trivial name
15 lecithin and a phospholipid (I), wherein R₃ indicates 2-amino-1-ethyl is described with the trivial name kephalin. Suitable for example are naturally occurring kephalin or lecithin, e.g. kephalin or lecithin from soya beans or chicken eggs with various or identical acyl groups R₁ and
20 R₂, or mixtures thereof.

The phospholipid (I) may however also have a synthetic origin. Under the term synthetic phospholipid one defines phospholipids which with respect to R₁ and R₂
25 have a unitary composition. Such synthetic phospholipids are preferably the lecithins and kephalins defined previously, whose acyl groups R₁ and R₂ have a defined structure and are derived from a defined fatty acid with a

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degree of purity of more than approx. 95%. R₁ and R₂ may be the same or different and unsaturated or saturated. Preferably R₁ is saturated, e.g. n-hexadecanoyl, and R₂ unsaturated, e.g. 9-cis-octadecenoyl (oleoyl).

5

The term "naturally occurring" phospholipid (I) defines phospholipids which with respect to R₁ and R₂ do not have a unitary composition. Such natural phospholipids are likewise lecithins and cephalins whose acyl groups R₁ and R₂ are structurally undefinable and are derived from naturally occurring fatty acid mixtures.

10 The requirement "essentially pure" phospholipid (I) defines a degree of purity of more than 90% (weight), preferably more than 95%, of the phospholipid (I), which can be proven by way of suitable methods of determination, e.g. paper chromatographically, with thin film chromatography, with HPLC or enzymatic colour test.

15

In a phospholipid (I) R₃ has the meaning C₁₋₄ alkyl for example methyl or ethyl. The meaning methyl is preferred.

20

R₃ with the meanings C₁₋₅-alkyl substituted by carboxy, C₂₋₅-alkyl substituted by hydroxy or C₂₋₅-alkyl substituted by carboxy or hydroxy are for example 2-hydroxyethyl, 2,3-dihydroxy-n-propyl, carboxymethyl, 1- or

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2-carboxyethyl, dicarboxy-methyl, 2-carboxy-2-hydroxyethyl or 3-carboxy-2,3-dihydroxy-n-propyl.

5 R₃, with the meaning C₂₋₅-alkyl substituted by carboxy and amino is e.g. 3-amino-3-carboxy-n-propyl or 2-amino-2-carboxy-n-propyl, preferably 2-amino-2-carboxy-ethyl. Phospholipids (I) with these groups may be present in salt form, e.g. as sodium or potassium salt.

10 Phospholipids (I), wherein R₃ indicates the inositol or glyceryl group, are known under the descriptions phosphate idylinositol and polyphosphate idylglycerol.

15 For the acyl residuals in the phospholipids (I) as well as in the triglycerides (II) the descriptions indicated in brackets are usual:

20 9-cis-dodecenol (lauroleoyl), 9-cis-tetradecenoyl (myristoleoyl), 9-cis-hexadecenoyl (palmitoleoyl), 6-cis-octadecenoyl (petroseloyl), 6-trans-octadecenoyl (petroseidoyl), 9-cis-octadecenoyl (oleoyl), 9-trans-octadecenoyl (elaidoyl), 9, 12-cis-octadecadienoyl (linoleoyl), 9,12,15-cis-octadecatrienoyl (linolenoyl),
25 11-cis-octadecenoyl (vaccenoyl), 9-cis-icosenoyl (gadoleoyl), 5,8,11,14-cis-eicosatetraenoyl (arachidonoyl), n-dodecanoyl (lauroyl), n-tetradecanoyl (myristoyl), n-hexadecanoyl (palmitoyl), n-octadecanoyl

(stearoyl), n-icosanoyl (arachidoyl), n-docosanoyl (behenoyl), n-tetracosanoyl (lignoceroyl).

A salt of the phospholipid (I) is preferably pharmaceutically acceptable. Salts are defined by the existence of salt forming groups in substituents R, as well as by the free hydroxy group of phosphorous. Likewise the formation of inner salts is also possible. Preferable are alkali metal salts, in particular sodium salts.

10

The component c) is added in a preferred concentration of approx 0.05 to 1.0% by weight, preferably 0.05 to 0.1% by weight with respect to the total weight of the formulation. In a particularly preferred embodiment 15 form one uses a purified lecithin of soya beans of the quality LIPOID S 100.

Component d): in one of the triglycerides of the formula II used as component d) R₁, R₂, R₃ mean a straight-chained C₈₋₂₄-acyl with an even number of C-atoms, 20 in particular n-octanoyl, n-dodecanoyl, n-tetradecanoyl, n-hexadecanoyl, n-octadecanoyl, 9-cis-dodecenoyl, 9-cis-tetradecenoyl, 9-cis-hexadecenoyl, 9-cis-octadecenoyl or 9-cis-icosenoyl. The meanings of R₁, R₂, R₃ maybe identical 25 or different, wherein the individual groups R₁, R₂, R₃ themselves are structurally unitarily defined. This is characteristic for synthetic or semi-synthetic triglycerides. R₁, R₂, R₃ may however also consist of vari-

ous acyl groups of various structures. This is characteristic for triglycerides of a natural origin.

A triglyceride of the formula II is a semi-synthetic or synthetic, essentially pure triglyceride or a pharmaceutically used triglyceride of a natural origin. Preferred is a triglyceride of a natural origin, e.g. peanut oil, sesame oil, sunflower oil, olive oil, maize oil, soya oil, castor oil, cotton seed oil, rape oil, thistle oil, grape core oil, fish oil or coconut oil. In a particularly preferred embodiment form of the invention one uses a triglyceride with the term neutral oil with various acyl groups of a different structure, e.g. a triglyceride of the fractionated coconut fatty acids C₈-C₁₀ of the type 15 Miglyol®, e.g. MIGLYOL 812.

The triglyceride (II) is, in the composition defined further above, contained in a preferred concentration range of approx. 0.1 to 2.0% by weight, preferably 20 0.1 to 1.0% by weight with respect to the total weight of the formulation.

The component e) - water as a carrier fluid in the purity required for the dermal application, is according to regulations of the national pharmaceutical list, 25 free of germs and pyrogens.

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The component f) - aiding agents suitable for dermal application is contained as a facultative component. Such aiding agents are contained in creams, ointments, gels, lotions, pastes, foams, tinctures or lotions.

5

Suitable are in particular ethanol, in particular in low quantity parts of approx 0.1 to 5%, isopropanol, further preservatives, e.g. benzalconium chloride, phenoxyethanol, further benzoe acids or their salts, 4-hydroxy-benzoe acid esters (PHB-esters), phenols, e.g. tert.-butyl-4-methoxy- or di-tert.-butyl-4-methylphenol, benzylalcohol, 4-chlor- or 2,4-dichlorbenzylalcohol, 2-phenylethanol, chlorhexidindi acetate or digluconate, thiabendazol, cetyltrimmonium bromide, cetylpyridinium bromide, phenododecinium bromide or sorbic acid, antioxidants, e.g. ascorbic acid, cysteine, sulphites, e.g. sodium bisulphite, thioglycol or glutathion, essential oils for improving the smell, i.e. menthol oil, orange oil, bitter orange oil, mandarin oil or lemon oil, or solvents or means for preventing evaporation, e.g. polyalcohols, e.g. propylene glycol, polyethylene glycol or glycerine.

Likewise the subject-matter of the present invention is the method, known per se, for manufacturing the pharmaceutical composition, which is characterised in that one mixes a lipophile phase consisting of the components a) to d) with the aqueous carrier fluid which where

appropriate contains aiding agents suitable for dermal forms of administration, and where desired subjects the obtainable clear opalescent dispersion based on nanoparticles - nanodispersion - to the following subsequent operations: the addition of a further quantity of water as a carrier fluid as well as where appropriate further water soluble aiding agents, which are suitable for dermal forms of administration, and where appropriate filtration (e.g. sterile filtration) of the nanodispersion; and/or further processing of the nanodispersion to a dermal preparation.

According to this method one manufactures a lipophile phase "oil phase" consisting of the component c) - phospholipid (I) -, ethanol, component b) - partial fatty acid ester of polyoxyethylene sorbitan -, component a) - active ingredient, and of the component d) - triglyceride (II). The mixing of the components is effected at room temperature at low speed with a conventional stirrer with a propeller or winged blade, a magnet stirrer or static mixer.

In a preferred embodiment form of the invention one uses a combination of various partial fatty acid esters of polyoxyethylene sorbitan, in particular the combination consisting of polysorbate 20, 80 and 60. At the same time one respects the sequence, in that one first mixes the phospholipid and the ethanol together and then adds after one another polysorbate 20, 80, 60.

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Subsequently one adds neutral oil. By mixing the lipophile phase ("oil phase") with the aqueous phase, which may contain water soluble facultative additions, e.g. preservatives, with a low speed mixing machinery (200 to 1,000 r.p.m.) there forms the pharmaceutical composition defined earlier, which may be defined as a dispersion of colloidal nanoparticles of the lipophile active ingredient hydrocortisone or simplified as a nanodispersion. On account of laser light dispersion measurements and recordings in the electron microscope the colloidal particles, present in the nanodispersion, of other formations such as fluid crystals, micelles, reverse micelles or liposomes may be distinguished. For the statistical majority of more than 95%, preferably more than 98% an average particle size of less than 50nm is characteristic.

For characterising the obtainable nanodispersion, methods known per se are suitable, e.g. optical judgement: weak to strong opalescence of the preparation can be easily recognised (indication of an average particle size of smaller than 50 nm), laser light dispersion (determining the particle size and homogeneity), electron microscopy (freezing breakage and negative contrast technology).

25

The nanodispersion is after the addition of the desired quantity of water and where appropriate further aiding agents, applicable for dermal forms of administra-

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tion, e.g. directly applicable as a dosage spray. A particular advantage with respect to conventional dermal preparations is the possibility of sterile filtration. If desired by way of sterile filtration one may separate all
5 larger particles with a diameter larger than approx. 200 nm in the dispersion, as well as floating and solid matter, and thus manufacture a nanodispersion with a fraction of particles with a relative uniform size.

10 Measured quantities of nanodispersion are filled, where appropriate as a concentrate, in suitable containers for a dose unit. Suitable vessels are e.g. vessels for pump sprays or dosage sprays or plastic vessels with an outlet device.

15 The pharmaceutical composition described earlier with the anti-inflammatory agent hydrocortisone is suitable as a dermal preparation for treating many diseases of the skin or on the eye. At the same time one
20 applies the preparation in the prescribed dosage.

The following example illustrates the invention:

Recipe for a hydrocortisone 0.1% - nano-

5 colloidal dosage spray formulation.

	position	dosage	amount	component
		% (w/w)	g	
	1	0.063	7.56	Lipoid S100
	2	0.625	75.00	Ethanol abs.
10	3	1.750	210.00	Polysorbate 20
	4	1.000	120.00	Polysorbate 80
	5	0.175	21.00	Polysorbate 60
	6	0.105	12.60	hydrocortisone Base micro BP88
15	7	0.750	90.00	Miglyol 812
	8	94.930	11391.60	Aqua purificata
	9	0.602	72.24	phenoxyethanol
	Total	100.00	12000.00	

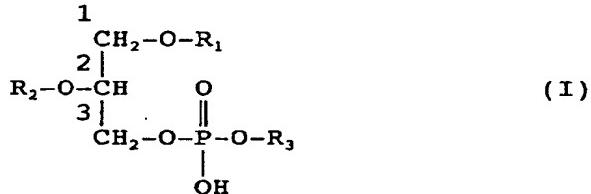
20 By the addition of (9) into (8) at room temperature one manufactures the aqueous phase. One obtains the oil phase by placing (1) into (2) until the solution becomes clear. Subsequently one adds after one another (3), (4), and (5) - polysorbate 20, 80 and 60 and stirs, 25 until the mixture becomes clear. One adds the active ingredient (6) in three portions, and heats to 60° C until crystals are no longer visible. One adds (7) mixes until the solution becomes clear and cools to room temperature.

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One unifies the aqueous phase with the oil phase, in that one places the aqueous phase at room temperature and stirs at 300 - 400 r.p.m with a magnetic stirring machinery. Subsequently one injects over a period 5 of time of approx. two minutes slowly under the level the oil phase into the aqueous phase. One stirs for a further 5 - 10 minutes avoiding foam formation and filters the nanodispersion through a germ filter ($0.2\mu\text{m}$).

Claims

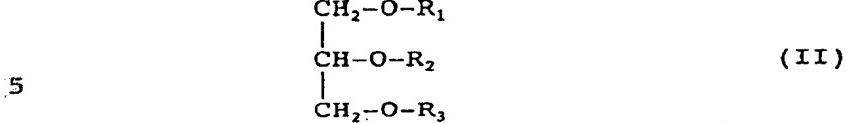
1. A pharmaceutical composition for the dermal application of a corticoid containing:
- 5 a) the active ingredient 11, 17, 21 -trihydroxypregn-4-en-3,20-dion (hydrocortisone) or a derivative thereof, where appropriate in combination with a wound healing agent;
- 10 b) at least one partial fatty acid ester of polyoxyethylene sorbitan or a combination thereof;
- 15 c) at least one essentially pure phospholipid of the formula:



20 where R_1 indicates C_{10-20} -acyl, R_2 hydrogen or C_{10-20} -acyl, R_3 hydrogen, 2-trimethylamino-1-ethyl, 2-amino-1-ethyl, C_{1-4} -alkyl, C_{1-5} -alkyl substituted by carboxy, C_{2-5} -alkyl substituted by hydroxy, C_{2-5} -alkyl substituted by carboxy and hydroxy or C_{2-5} -alkyl substituted by carboxy and amino, the inositol or glyceryl group, or salts of these compounds;

25 d) a triglyceride of the formula:

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where R₁, R₂ and R₃ indicates C₈₋₂₄-acyl;

- 10 e) water as a carrier fluid in the purity required for the transdermal application; and where appropriate
- f) aiding agents suitable for dermal forms of administration.
- 15 2. A pharmaceutical composition according to claim 1, containing as component a) the active ingredient hydrocortisone or the 21-acetate, 21-acetate-17-propionate (aceponate), 21-bendazac, 17 α -butyrate, 17 α -butyrate-21-propionate, 21-cipionate (cyclopentane propionate), 21-disodium phosphate, 21-hydrogen succinate, 21-sodium succinate, 21-tebutate (tert. butyl acetate), 17-valerate or xanthogenate, where appropriate in combination with an epithelisation agent.
- 25 3. A pharmaceutical composition according to claim 2 containing as a component a) the active ingredient hydrocortisone or the 21-acetate, where appropriate in combination with dexpanthenol.
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4. A pharmaceutical composition according to one of claims 1 to 3 containing as component b) a combination of various partial fatty acid esters of polyoxyethylene sorbitan.

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5. A pharmaceutical composition according to claim 4 containing as component b) the combination consisting of polysorbate 20, 80, 60.

10

6. A pharmaceutical composition according to one of the claims 1-5 containing as component c) purified lecithin of soya beans and as component d) a triglycerid from the group of neutral oils.

15

7. A pharmaceutical composition according to one of the claims 1-6 containing
a) the active ingredient hydrocortisone as a free base or the 21-acetate, where appropriate in combination with dexpanthenol;

20

b) the composition consisting of polysorbate 20, 80 and 60;

c) purified lecithin from soya beans;

d) a triglyceride from the group of neutral oils; and

25

e) water as a carrier fluid in the purity required for the dermal application; and where appropriate

f) aiding agents suitable for dermal forms of administration.

8. A method for manufacturing the pharmaceutical composition according to claim 1 for the dermal application of a corticoid, characterised in that one mixes a lipophile phase consisting of the components a) to d) with the aqueous carrier fluid which where appropriate contains aiding agents suitable for dermal forms of administration, and where desired subjects the obtainable clear opalescent dispersion based on nanoparticles - nanodispersion - to the following subsequent operations: the addition of a further quantity of water as a carrier fluid as well as where appropriate further water soluble aiding agents, which are suitable for dermal forms of administration, and where appropriate filtration of the nanodispersion; and/or further processing of the nanodispersion to a dermal preparation.

9. A method according to claim 8, characterised in that as component b) one uses the combination consisting of polysorbate 20, 80 and 60.

10. A method according to claim 9, characterised in that one adds polysorbate 20, polysorbate 80 and polysorbate 60 after one another.

25 11. The dispersion based on nanoparticles obtainable according to the method according to claim 7

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12. The concentrate, filtrate or dry preparation containing nanoparticles with the active ingredient hydrocortisone, obtainable according to the method according to claim 7.

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Cortisol spray

Abstract

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The present invention relates to a pharmaceutical composition for the dermal application of hydrocortisone. One disperses this active ingredient with the addition of a partial fatty acid ester of polyoxyethylene sorbitan and of further aiding agents such as lecithin and neutral oil. With this one obtains a suspension of nanoparticles of the lipophile active ingredient hydrocortisone.

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